

It will be noticed that the scheme I have outlined is closely analogous to the system already general in connection with medical training, where the lecturing and professorial staff on the technical side consists almost entirely of old students (occasionally from other colleges) who are beginning to make their way professionally, or who, by the time they have become professors, have actually made their way to the highest ranks of their profession.

### HARVEY AND THE PROGRESS OF MEDICAL SCIENCE.<sup>1</sup>

AFTER some introductory remarks, Dr. Roberts referred to Harvey's work, and especially to his great discovery of what is commonly spoken of as the "circulation of the blood," though his published treatise is really on the "movements of the heart and of the blood." He re-affirmed their implicit belief in the absolute priority of Harvey's claim to this discovery, and spoke of its magnitude and far-reaching effects, which had been described in various and glowing terms, in no way exaggerated. Nor must they forget the formidable difficulties under which Harvey carried out his investigations; the profound errors which he had to combat and overthrow, and the confusion he had to clear away; his indomitable perseverance; and the masterly yet courteous manner in which he disputed and ultimately overcame the objections which had been raised against his views.

The orator then gave an outline of Harvey's career, dealing more especially with his association with the College of Physicians, where he held the position of Lumsian Lecturer from 1615 to 1656, in the very first course of lectures presenting a detailed exposition of his views concerning the circulation of the blood, which continued to form one of his subjects for several years. In the deed by which Harvey conveyed to the college his estate, he laid down three definite and distinct injunctions or instructions as to the subject-matter of the oration, which it was their duty to follow. The first injunction is that "there shall be a commemoration of all the benefactors of the said College by name and what in particular they have done for the benefit of the said College, with an exhortation to others to imitate these benefactors and to contribute their endeavours for the advancement of the society according to the example of those benefactors."

Dealing with this injunction, Dr. Roberts first mentioned individually Harvey himself; Thomas Linacre, the practical founder of the College of Physicians; and John Caius. He then considered generally as benefactors those who had held high office, alluding specially to that of President; those who had founded lectureships, or had given endowments for prizes, medals, or scholarships; those who had contributed to the library or to the general funds; and those who by their professional or scientific attainments and achievements, as well as by their high personal character, general culture and scholarship, and intellectual and moral qualities have shed unfading renown and lustre upon the College of Physicians.

In discussing the second injunction, namely, to "exhort the Fellows and Members of this College to search and study out the secrets of nature by way of experiment," the orator made a passing allusion in favour of vivisection, claiming for this method of investigation the cordial support of the medical faculty as a whole, with comparatively few exceptions. After referring to what the College had done as a body in advancing scientific research, he enlarged upon the great activity and promising aspects of modern research, more particularly in relation to subjects connected with the medical profession, and expressed his belief that Harvey would be amazed and fully satisfied were he to come on the scene at the present time, and realise the extent and thoroughness with which his exhortation is being carried into effect in all directions. Dr. Roberts then gave an abstract of what he had prepared for the oration with reference to the progress of know-

ledge and practice in connection with the circulatory system since Harvey's time, and the methods by which it had been brought about. He also directed attention to some of the more prominent examples of the beneficial results on an extensive scale of scientific and practical research, and alluded specially, as being closely connected with the circulatory system, to the "brilliant victories" which had been achieved against malaria in various parts of the world, many of them forming an integral part of this vast Empire. While paying a tribute of respect and admiration to all those who at the risk of life and health have gone forth to dangerous climates to study and fight against this and other tropical diseases, Dr. Roberts mentioned specially Dr. J. E. Dutton, the latest "martyr of science," as he had been aptly called, whose lamented death recently occurred on the Congo, where he had gone to study sleeping sickness on behalf of the Liverpool School of Tropical Medicine. He expressed on behalf of the college their deep sense of the great services which Dr. Dutton had rendered to the medical profession and to humanity, their profound regret at the premature cutting off of such a valuable life and promising career, and their heartfelt sympathy with his bereaved family and friends.

The orator concluded as follows:—"The last and most agreeable duty laid upon me by Harvey's direction is to exhort the Fellows and Members, for the honour of the profession, to continue in mutual love and affection among themselves, without which neither the dignity of the College can be maintained, nor yet particular men receive that benefit by their admission into the College which they might expect, ever remembering that *concordia res parvae crescunt, discordia magnae dilabuntur*." With regard to the future position and reputation of this college in relation to scientific research and the progress of medicine, there can be no doubt or misgiving when we see amongst our younger fellows and members so many who are endowed with great abilities, who are full of energy, intellectual vigour, and enthusiasm in their work, and whose achievements have already brought them into conspicuous prominence and, in some cases, into the foremost ranks of our profession. May we not confidently hope that they will also ever keep in mind Harvey's last exhortation, and unflinchingly strive to maintain the high standard of character and conduct which he has placed before them? But should they at any time feel the need of an example, a stimulus, or an inspiration, let them steadily fix their attention and thoughts upon the personality, the life, and the work of our "immortal and beloved Harvey," whom it is our privilege and pride and happiness to commemorate on this anniversary.

### HIGH TEMPERATURE RESEARCH ON THE FELSPARS.

AN elaborate investigation of the melting points of the feldspars, devised and carried out by Messrs. Day and Allen in the physical laboratory of the United States Geological Survey, is described in a memoir just received.<sup>1</sup> The geological importance of laboratory research at high temperatures was strongly urged by the late Clarence King and Dr. Becker, and the well known work of Dr. Carl Barus has already furnished petrologists with a number of valuable data. The laboratory, discontinued in 1892 for want of funds, has been re-established by the exertions of Dr. Becker, and the piece of work before us has been in part subsidised by the trustees of the Carnegie Institution.

The authors describe in detail, for the benefit of other experimenters, the thermoelectric method by which they have been enabled to measure high temperatures with an error of not more than one degree. It was also found necessary to adopt some method of determining the instant of melting (where such exists) independently of the personal judgment of the operator. It appears that in

<sup>1</sup> Abstract of the Harveian Oration delivered at the Royal College of Physicians on June 21 by Dr. Frederick T. Roberts.

<sup>1</sup> "The Isomorphism and Thermal Properties of the Feldspars." Part i. Thermal Study. By Arthur L. Day and E. T. Allen. Part ii. Optical Study. By J. P. Iddings. With an introduction by George F. Becker. Pp. 95; xxvi plates. (Washington, 1905.)

such minerals as the feldspars the viscosity of the fused substance may be of the same order as the rigidity of the solid crystal approaching fusion, so that there is to the eye no abrupt change. The discordance between the results

temperature is to be regarded as a superheated solid or as a liquid crystal, in which deorientation is prevented by extreme viscosity.



FIG. 1.—Tabular Crystals of Bytownite from Middle of Crucible. From "The Isomorphism and Thermal Properties of the Feldspars."

of different experimenters is largely attributable to this fact. The method followed was therefore to plot as a curve the relation between temperature and time, and to note the place where a change in the shape of the curve indicates an absorption of latent heat. To avoid the disturbing influence of impurities, the several feldspars to be examined were prepared artificially. Thin slices of the crystallised products were studied optically by Prof. Iddings, and they are illustrated in the memoir by a series of beautiful plates.

Anorthite was the feldspar most easily crystallised, and its curve gave a sufficiently sharp melting point at  $1532^{\circ}$ . Other varieties examined had the compositions  $Ab_1An_5$ ,  $Ab_1An_2$ ,  $Ab_1An_1$ ,  $Ab_2An_1$ ,  $Ab_3An_1$ . These gave progressively lower melting points; but it was found that, in passing from anorthite towards the albite end of the series, viscosity rapidly increases and obscures the phenomenon of fusion, the break in the curve of heating becoming for  $Ab_3An_1$  a barely perceptible deviation. For albite, and also for orthoclase, the method fails to give any result, and in a certain sense it may be said that the alkali-feldspars have no melting point. In this connection, a special series of experiments gave some remarkable results. A small fragment of crystalline albite, embedded in albite glass, was heated to  $1200^{\circ}$  and slowly cooled. Thin slices showed that the crystal had melted to a glass only along cleavage and other cracks. The experiment was repeated with higher temperatures of heating up to  $1250^{\circ}$ , and it was found that, though the lanes of glass encroached more and more upon the crystal, considerable relics of the latter were still left, preserving undisturbed their original orientation. It thus appears that a mineral like albite, which melts to an ultra-viscous liquid, may be maintained for half an hour at a temperature well above its normal melting point without being completely fused. It seems doubtful whether the crystalline substance at such a

Feldspar	Melting Temperature	Specific Gravity	
		Crystals	Glass
Anorthite	... $1532^{\circ}$ ...	2'765	2'700
$Ab_1An_5$	... $1500^{\circ}$ ...	2'733	2'648
$Ab_1An_2$	... $1463^{\circ}$ ...	2'710	2'591
$Ab_1An_1$	... $1419^{\circ}$ ...	2'679	2'533
$Ab_2An_1$	... $1367^{\circ}$ ...	2'660	2'483
$Ab_3An_1$	... $1340^{\circ}$ ...	2'649	2'458
Albite	... — ...	2'605	2'382

We reproduce in tabular form the chief numerical results obtained. The general conclusions arrived at are of great importance. The melting point curve for the lime-soda-feldspars, as well as the curve of specific volume, is continuous, and not very different from a straight line, and we have almost conclusive proof that this group of minerals forms a truly isomorphous series. Further, it belongs to type i. of Bakhuis Roozeboom, the melting point falling steadily from one end of the series to the other. Here a further point of interest arises. According to theory, the crystals first formed from the fused mass should be richer in anorthite than the liquid from which they separate, and should contain an increasing proportion of albite as crystallisation proceeds. Day and Allen, however, verified in several cases that their crystals had the same composition as the mother liquid. This can only be due to undercooling, the beginning of crystallisation being deferred until the temperature had fallen below the range proper to normal crystallisation. Those natural rocks in which the feldspar crystals show a zoned structure (the outer zones richer in albite) must have crystallised without undercooling, and, indeed, their feldspars



FIG. 2.—Spherulite of Plumose Bundles of Prismatic Crystals of Labradorite. From "The Isomorphism and Thermal Properties of the Feldspars."

must have been formed within a certain range of temperature, which can be more or less closely determined. In this and other petrological applications the work of the authors affords a valuable supplement to that of Vogt.

A. H.